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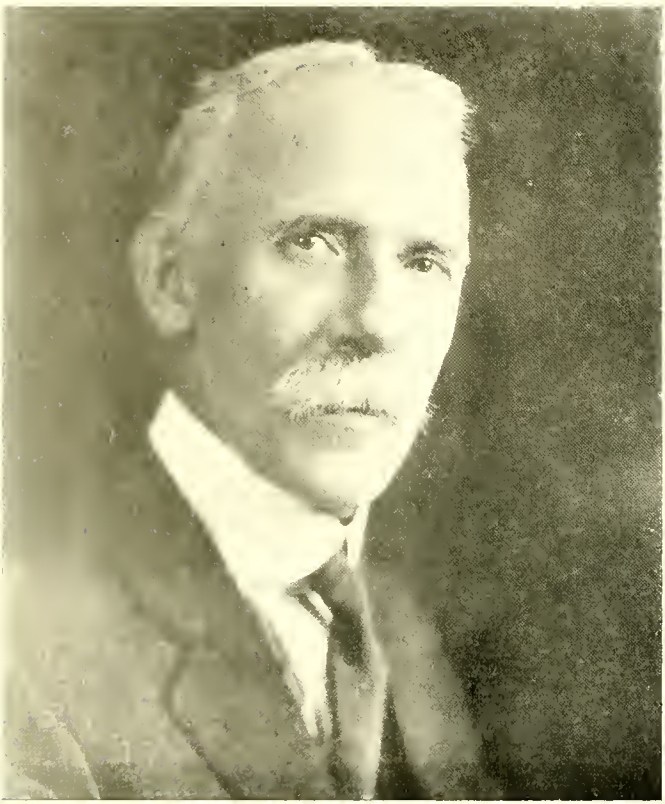
Dedication

TO FRANCIS PRESTON VENABLE

Our Former Leader, our Teacher, and our Friend
This Number is Dedicated



DR. FRANCIS P. VENABLE

- - E D I T O R I A L - -

Just a Passing Tribute

At the 127th commencement of the University of North Carolina, President Chase read the announcement of Dr. Venable's resignation as head of the Department of Chemistry. As the President read that announcement a deep silence prevailed throughout the audience. A great leader, a great executive, and a great teacher was relinquishing his responsibilities as Department head and was returning, as it were, to private life. It was fitting that a silence should prevail. It was a silent tribute to the man who had given more than forty years of his life in the service of the University—in service to the University which he loved, which he had labored for, and for which he was still laboring.

But let us not deceive ourselves in thinking that Dr. Venable has given up his work in the Department. He has merely given up the leadership—and that is all. His interest and his influence—two mighty factors—still abound. He still teaches his classes as before, is still carrying on his researches, and has problems assigned to his research students.

Dr. Venable came to the University when virtually there was no Department of Chemistry. With the meagre facilities which were offered him and the small (if any) sums available, he has reared the Department and brought it to its present stage of progress where it is recognized throughout the country. But he has not stopped with this. He has honored the Department in no small way as author; having published some half dozen books and numerous papers.

It is fitting, therefore, that we should pay our passing tribute to our former leader, our teacher, and our friend—Francis Preston Venable.

We Salute Our New Leader

And during the silence there was none the less interest taken in the reading of the successor to Dr. Venable. The man who assumed the office has been intimately associated with Dr. Venable in his many researches. He came to the University more than ten years ago, and since then has been an able force in the development of the Department.

Under our new leader we can look boldly to the future without disappointment. "We fear no foe," his hand will lead us safely.

And so we salute our new leader—James Munsie Bell.

A Message to the Alumni

In these few lines, which are directed to every Alumnus of the Department, young and old alike, let us enter for a few moments into a heart-to-heart discussion of THE CHEMIST. It may be well for us at the outset to call to mind a few facts about the history of THE CHEMIST, and later we shall outline its purpose and make suggestions as to its future plans and development.

The first issue of THE CAROLINA CHEMIST bears the date of January, 1915. It was originated by Dr. William Lewis Jeffries, then a member of the faculty of chemistry at the University. To this one, who conceived the idea of the publication in a spirit of service and coöperation among faculty, Alumni, and students, we owe a debt of gratitude. Dr. Jeffries gave his life to his chosen work. He died in 1917.

The first number contained only eleven pages of printed matter, and yet the reception given it by the Alumni and students was so gratifying that its support seemed certain. It has steadily grown in size and circulation since its beginning, and the last issue of Vol. VI, published in December, 1920, con-

tained about thirty pages of reading matter.

So much for the past.

With this issue of THE CHEMIST some very important changes, consistent with its growth, have been made. If you will compare it with past issues you will find that the page has been made larger and is divided into columns, and the quality of paper has been changed. In short, the make-up of the publication has been made attractive.

These changes have been made for you and we believe you will welcome THE CHEMIST in its new cover and make-up, and will take in it the added interest that it deserves.

The kind and number of articles that are published now differ greatly from those of Vol. I. We are not only trying to give you the full news of the department and of your fellow Alumni, but the scope has been broadened further. A variety of interesting articles dealing with some process of Chemical Manufacture, or some process of theoretical interest, will be printed in each issue. In addition, we intend to broaden the field of service offered to the High Schools. The coming issues will carry articles dealing with chemistry in relation to the High School student.

These, then, are our plans. Now we shall ask you to do the talking. Criticize the plans; offer suggestions. Tell us frankly if they do or do not meet with your approval.

We come now to the final chapter in this discussion. The heading of this chapter we shall call *coöperation*, for want of a better term. "If you do not believe in coöperation," says *The Chemist Analyst*, "take one of the wheels off of a wagon and see what happens." In the same way, take out one of the Alumni supporters of THE CHEMIST and see what happens—a drag. Let us repeat, for the sake of emphasis, what has been said before: this publication is yours. We have asked your advice in regard to it and we solicit your criticisms and suggestions. Certainly you will support your *own* publication; then kindly send your dollar to THE CHEMIST which will pay your year's subscription. You can no more expect THE CHEMIST to live and serve you without your support than you can expect to live without food. If you have a lively interest in your Alma Mater, and the Department which "raised you," you will, on finishing this, write a check for one dollar and mail it to THE CHEMIST. One dollar will not count for much with you, but it will help THE CHEMIST greatly, and enable it to serve you even greater.

What will be your answer?

THE EDITOR.

THE CHEMIST OF THE FUTURE

By STROUD JORDAN, Ph. D., '09

[Whether you agree with the thought in this article or not, you should read it. Certainly the writer opens a field for discussion. He has been out in the industries and is in a position to give the reader the viewpoint of the salaried chemist.—THE EDITOR.]

On all sides you will find chemists bemoaning the fact that so many of their ranks are out of work and looking for possible locations. This is for the most part due to the overcrowding of the ranks during strenuous times when so many enter the profession who were not fitted for anything but emergency service. They should enter College again and take a certain amount of graduate work for use in their professional work, since a graduate degree is almost a requisite if one wants to become more than a mere analyst.

In direct contrast to this state of affairs is the fact that you will not find factory superintendents, managers, and even foremen laid off as were the chemists. The organization seems to need the services of everyone more than the

chemist and when the axe falls the chemist is one of the first to suffer. I will not agree with this stand, but nevertheless it is a fact. Look around and then ask yourselves why this state of affairs exists. It can only be explained by the fact that a chemist may be "fired" and another taken in to fill his place on short notice, just as a bookkeeper or clerk, and progress not be hampered to any great extent. Not so with the factory orgainzation, for every cog in this wheel is necessary and the organization must be kept intact, even in the most trying times. Why isn't the chemist as necessary as any other cog? The answer to this question is that he has been content to stay in the laboratory and knows little or nothing about production methods. He couldn't take charge of and run the plant if the manager should be fired or die, but why shouldn't he be able to do this very thing? *We must be more practical and delve into actual production if we would be a necessary asset.* Wherever a chemist has been held on in an orgainzation he has been credited with doing work which shows in the profit column and is not charged off to red figures at the end of each year. The managers of business can be persuaded of the necessity of any department only by actual figures of savings made or profits earned by that department, and if the chemists are willing to draw their salary and make monthly reports, or whatever reports are required, and never show the financial side of such reports then they never get the credit for their work. The old adage, "Do not hide your light under a bushel," is just as true now as it was before the Phlogiston theory was exploded.

Now to hit the mark intended in this article on the chemists of the future, it is necessary to point out briefly that the positions where a chemist is hired are necessarily limited and will not keep apace with the production of chemists of the future; so that new outlets must be looked up. I am referring now to the practice of chemistry as a profession, just as a lawyer or a doctor practices his profession. How many lawyers or doctors do you find who contemplate working for some corporation or for a salary? Why should over ninety per cent of the chemists turned out from college look forward to "getting a job"? Why haven't they a job already picked out to work for themselves? What have they done with their time in college along research lines? Why have they not picked out problems which would give them ample work to carry out after college days are over?

The South is teeming with possibilities for manufacture and development where a chemist may start with little capital and build a business for himself in which he is his own paymaster. The undeveloped resources at your command are unlimited and it needs only a legitimate amount of search to uncover possibilities which will pay you far more than a salary with some corporation.

Lay out your research along practical lines and do those things which may be translated into the upbuilding of business, if you expect to go into industrial work; and be ready when you finish your work to start working for yourself. Rest assured that if you are worth a given amount to an individual or corporation that you are certainly worth more than that to yourself. Any corporation who pays a salary expects to make a profit on that salary or it is discontinued.

The chemists of the future must look forward to working for themselves rather than working for some corporation on a salary basis, and in this way the profession will be built up; for the more chemists who are productive for themselves, the more the world will see the necessity of the chemist and his work.

The next issue of THE CHEMIST will be published in March. If you have not already subscribed, do so at once.

DR. FRANK C. VILBRANDT IS ADDED TO THE CHEMICAL FACULTY

The need of a professor to take charge of all the classes in Industrial Chemistry has been felt for several years. But it was not until last year that the Department was granted the privilege of fulfilling this need.

Dr. Frank Carl Vilbrandt, the new addition to the faculty, is a native of Ohio and comes to us from Ohio State University, where he received his B. S., M. A., and Ph. D. degrees, the last in Industrial Chemistry. He has taken charge of the class in Industrial Chemistry known as Chemistry 11-12, and the class in Industrial Analysis, and is directing several of the senior students in research.

Dr. Vilbrandt held an instructorship at Ohio State and while there did extensive research in petroleum and its products, beet sugar purifications and manufacture, bacteriology and microscopic determination of chemicals, and did consulting work in industrial problems, such as acid fume prevention, manufacture of arsenical insecticides, mine-water stream pollution, lime-sulfur spray manufacture, and electrolytic chlorate production. During the war he was with the Bureau of Mines and the Research Bureau of the Army. It was with the latter that he was gassed doing research in poison gas. For two years prior to the war, he was with the Bureau of Standards in Washington.

Dr. Vilbrandt is a member of the following organizations: Phi Beta Kappa, Sigma Xi, Phi Lambda Upsilon, American Chemical Society, American Institute of Chemical Engineers, and various others of less importance. He has published numerous articles in technical journals.

From the foregoing, it is indeed evident that the Department is to be congratulated on securing Dr. Vilbrandt's services. Though as young as university professors usually run, he has because of that brought new ideas and spirit into the Department, and has been one of us since the day of his arrival.

L. V. PHILLIPS.

CHEMICAL INSPECTION TRIP

In the spring of 1920 Dr. Bell chaperoned some half dozen young chemists on an inspection trip to the chemical plants in and around Philadelphia. It was hoped that this might become an annual affair, but for some reason the trip was not made last year. This trip supplies a much needed element in the course in chemical engineering, for while the theoretical training received here is of the best, the opportunity to see and study the applications of the science is sadly lacking. Since it will be two years in April since the inspection trip was made, there should be this year a sufficient number wishing to take advantage of such an opportunity to make it well worth while. The University will pay the expenses of the professor in charge if as many as six students will agree to go on the trip. The time for the tour will be during the Easter holidays which will begin April 13, and end April 20, (1922).

WATCH FOR IT!

High School Teachers and Students Especially Take Notice

In the next issue of THE CHEMIST, we will publish an article dealing with Chemistry in relation to the High School student. This will be an opportunity not only to High School students, but also to teachers and those who think of teaching Chemistry in the High School.

If you have not already reserved your copy of the next issue, please do so at once.

DR. CHARLES H. HERTY IS NAMED FIRST PRESIDENT OF NEWLY FORMED SYNTHETIC CHEMICAL MANUFACTURERS' ASSOCIATION

Mr. Harrison E. Howe has been elected to succeed Dr. Charles H. Herty as editor of the *Journal of Industrial and Engineering Chemistry* and director of the A. C. S. News service. Dr. Charles L. Parsons, of Washington, secretary of the society, states that Mr. Howe has accepted the positions.

Dr. Herty resigned the editorship to which Mr. Howe succeeds to accept the presidency of the newly formed Synthetic Organic Chemical Manufacturers' Association of the United States, which has opened offices on the thirty-fourth floor of the Metropolitan Tower at No. 1 Madison Avenue. Dr. Herty's career in chemical journalism has been varied by many public activities. By special appointment of President Wilson he went to Paris in 1919 as the representative of the United States in the matter of the distribution of German dye-stuffs under the economic clauses of the Peace Treaty. Dr Herty was also chairman of the committee of the American Chemical Society advisory to the Chemical Warfare Service, member of the dye advisory committee of the Department of State, and chairman of the advisory committee of the National Exposition of Chemical Industries. Before beginning this work, Dr. Herty had been a professor in chemistry at the University of Geogia and at the University of North Carolina. In his new position he will devote himself to the development of American synthetic organic chemical industry.—*Science.*

Chemical and Metallurgical Engineering has the following to say in regard to the presidency of the Synthetic Organic Chemical Manufacturers Association:

"The association has wisely selected Dr. Charles H. Herty of the *Journal of Industrial and Engineering Chemistry*, to be its first president. His vigorous enthusiasm and indomitable spirit have won for him a position second to none in the fight for the adequate recognition of American chemical industry."

WHY CHEMISTS NEED ENGLISH

By A. C. Howell

[Why do Chemists need English? What's the use of spending a year or more in taking English courses when you came to college to study Chemistry and to work for a B. S. degree in Chemistry? Why not take more courses in Chemistry, or perhaps Physics in place of this English?

The fact of the matter is more English courses need to be taken up, even if at the sacrifice of some of the Chemistry courses.

You will find an answer to your question in this article. Read it and decide for yourself.—The Editor.]

Students may be roughly divided into two classes; those who take the courses prescribed and ask no questions, and those who are always asking "Why." The former are easily managed, for they usually do not care what they do in college, so long as they get the coveted degree, and have a "college education." They usually have no definite aim in life, and drift where the current takes them.

Students of the latter group, and it is to them that this article is addressed, are the conscientious students, who are interested not only in a "college education," but in getting training for a useful life. They take no course that they cannot justify in their minds as something that will have either direct or remote bearing on their life work. They ask, "Does English have this bearing?" The answer is "Yes."

When a man comes to college to study chemistry, it is a difficult matter for him to see the practical advantages of courses in English. He can appreciate the necessity for mathematics, foreign languages, perhaps; but he thinks he knows enough about English. The real fact of the matter is that with the majority of students English is not a native gift. They do not know how to use correct Einglish. They seldom use it, and seem to care little about cultivating it. Perhaps they have never heard it correctly pronounced, or used with care and thought.

On the other hand, there are a few students who come from communities where correct English is the rule, and they know how to speak it; but even these often lack the requisites of good diction, concisness, unity of thought and a good vocabulary. It is quite evident to the teacher of English, after correcting the average college theme, that the art of speaking and writing well is not the gift of the average college man; and this truism is almost an axiom in the case of scientists.

Assuming, then, that the Chemist does not know how to speak and write good English, let us raise the question as to whether he will need it in his profession, or not. The majority of college students would be inclined to answer this question in the negative. Why, a chemist is concerned with running tests, and analyses; English does not help him do these things. Perhaps not, but it is apt to be instrumental in securing him a position where he can practice his ability as a chemist. It will help him hold down his position, after he has secured it, and finally, it will help him up the steep path that leads to advancement and success.

You ask, "How?", and you have a right to ask, and to know. "How can English help me in my profession?" Well, there are several fields of endeavor open to you as a chemist, after you have the coveted sheepskin tucked under your arm and your alma mater has gently pushed you out of her hospitable door. You may enter the teaching field, and enligten other budding chemists the nation over, either in high schools or in colleges. Obviously you will need to know how to speak and write correctly if you enter this field. As you advance, you will find that you will want to publish papers, perhaps books; of course you will want to know how to write them so that they will not be the subject of severe criticism but will bring you returns for your labors.

Probably, however, you will not become a teacher, but will enter the industrial field, and go into some manufacturing enterprise. Now, you will say, English will be of no earthly use to me. Possibly not, if you get your job without writing a letter or interviewing your employer. The chances are that you will have to do one or both of these things before you safely land it. Suppose you cannot write a satisfactory letter of application; and many a college man cannot, as the files in plenty of offices will demonstrate; you may never get an opportunity to interview the employer. If you should get an interview, a lack of knowledge of the art of speaking plainly, concisely and clearly is quite apt to lose you the job. Space does not permit the introduction of examples to prove these statemets; but anyone who has had to hire men will bear them out.

After you have your job, it will be necessary for you to write reports, read papers, and certainly, as you grow older, to write letters, give directions and do a thousand and one things that entail the use of language. Then, if you are poorly equipped, you will suffer, and perhaps lose many an opportunity for advancement.

There is another field open to chemists, which is perhaps the most lucrative and the most interesting of all. That is the field of the consulting chemist. Here, if at all, there is need for a command of the English language, a technical knowledge of the uses of words, sentences and paragraphs. The consulting chemist is called upon to write many letters answering questions of

grave importance, and if he cannot do this clearly, concisely, and correctly, his clients will go elsewhere. He must be a salesman as well as a chemist; and as a salesman, he must know the value and importance of language in putting his ideas across. No matter how good an analyst he may be, no matter how thoroughly he may know his subject, he will not attract the trade of the layman, the manufacturer, if he does not write his reports in an attractive, readable, interesting manner. He will learn how to do this in college, if he realizes the full value of the English courses which are offered.

Then there is another side to this English question. It is agreed that all chemistry and nothing else makes a man one sided. In order that a man may secure enough chemistry in college to enable him to start in the world, he must spend so much time on it that there is little opportunity for him to take anything else. Some foreign language, some related science and a few courses in English are all the outside contacts the chemits has in his course. Where is he to get his ability to carry on a conversation with other college men on topics outside his own field, his broad-minded outlook on life, his culture? Well, his English courses offer one source. In them he may add to his store of culture, and get a hold on certain facts and qualities of mind which will proclaim him an educated, cultured man. These qualities are not to be taken lightly; for they, too, have their values and uses in the scheme of life.

English is a tool. You, the chemist, must learn how to use it, must sharpen it, and then keep it edged. No man can do good work with a dull tool. He is always handicapped, and cannot compete with his more fortunate brother. The man who has sharp tools and knows how to use them is the man who succeeds, in the long run. Think of English as one of the tools you will have to use in your struggle for existence; learn to use it well.

THE CHEMIST MAY BE DOWN, BUT HE'S NOT OUT

By S. C. Smith

The past year has been one of depression in almost every industry, but none have been hit quite so hard as the newly established American Chemical Industries. The result of this has been that hundreds of chemists have been laid off and are at the present out of jobs, or are following some vocation other than their own. The depression was a natural consequence of the war and the period of inflation immediately following the war. This depression, while unpleasant, will not last; and in spite of the fact that hundreds of chemists are out of jobs, the prospect for chemistry in America is bright.

There is every reason for this hope. The world is constantly increasing its demand for products, while at the same time there is a constantly diminishing supply of raw material. This means that in the future the manufacturer has the problem not only of converting raw material into the finished product, but of substituting cheap and abundant material for the more expensive. This cheap material must be rendered serviceable, however, and here is where the man trained in research comes in. Moreover, synthetic materials are rapidly displacing natural products, and will continue to do so in the future. Economy of production demands the service of the trained engineer, and in the future the successful manufacturer will be the one who keeps a staff of trained engineers. The one who neglects this side will soon find himself stranded on the quicksands of bankruptcy. Without undue exaggeration we can say that the progress of civilization is dependent on science; and in the matter of production chemistry is paramount.

THE MONTREAL AND NEW YORK CHEMICAL MEETINGS

By Dr. A. S. Wheeler

The Society of Chemical Industry of Great Britain met this year with its Canadian branch at Montreal, August 29-31. Dr. Bell and I with our wives motored up the St. Lawrence river from Quebec in time to attend the meetings which were held at McGill University. The English delegation was headed by Sir. William J. Pope, President of the S. C. I. and Professor of Organic Chemistry at Cambridge University. Visitors from the United States were received as guests and were given a very cordial welcome. The presence of Sir William Pope greatly increased the interest and importance of the meeting. As head of the British Chemical Warfare Service during the war he became an authority on poisonous gases. In regard to mustard gas he made the statement that the production capacity of the Allies at the close of the war was so great that "if the Armistice had not intervened, in a few weeks the Germans would have been wading knee deep in it." He also suggested that preventive medicine had added greatly to the horrors of war since it had made possible armies of millions of men. Papers read at the meetings concerned Canadian industries with particular attention to her great wood pulp industry. A delightful luncheon was given each day at the best hotel, followed by an important address, one being by Dr. Charles Herty, former head of our Laboratory.

A motor trip down along Lake Champlain, then out through the Adirondack Mountains, back by Lake George and down the Hudson river brought us to New York in season for the fall meeting of the A. C. S.

Very little business came before the Council. It was decided to give a two thirds rate to students of chemistry, both undergraduates and graduates, provided they are working for a degree. At a public meeting of the society in the Columbia Gymnasium the Priestly Memorial Committee presented the society with a portrait of Joseph Priestly, copied from an original Stuart. It is to be hung in the National Museum at Washington. At another meeting a very impressive address on "Chemistry and the State" was delivered by Francis P. Garvan, President of the Chemical Foundation. At a big International meeting in the Great Hall of the City College Dr. Charles Baskerville, former head of our Laboratory, led the program with a paper on "Chemistry and Civilization." At the banquet at the Waldorf-Astoria Hotel especially interesting after dinner speeches were made by Sir William Pope, General Fries of the Chemical Warfare Service and Dr. Edgar F. Smith, President of the A. C. S.

The attendance was very large, the registration reached a total of nearly sixteen hundred.

ANNOUNCEMENT
A Thing You Cannot Afford to Miss

In the next issue of The Chemist, Mr. C. B. Carter will tell us in an interesting article about the *Mellon Institute of Industrial Research*, at Pittsburgh, Pa.

Mr. Carter is a fellow in Industrial Research at *Mellon Institute* and is in a position to write an authentic article about it and his work there.

Mr. Carter received his Ph. D. degree in Chemistry from the University in 1916.

CHEMICAL INDUSTRIES IN WEST VIRGINIA

By Ira W. Smithey

Associate Professor of Chemistry, University of West Virginia

The University of West Virginia is admirably situated for the study of industrial chemistry, for the region in which it is located abounds in all kinds of active and potential chemical developments, while other parts of the State, not very remote, are even more greatly favored by nature and art. This extensive and varied chemical development is due to two fundamental causes: (1) an almost unlimited supply of cheap raw materials of good quality may be easily obtained; and (2) an abundance of cheap fuel (gas) indispensable to certain classes of industries is found here.

There are in the State all told, 120 plants producing chemicals and chemical products. These plants represent an investment of $33,500,000 and employ an army of 18,000 men. Their products include coal tar, dyes of the most varied and delicate tints, and cut glass as delicate as can be found anywhere. They also produce medicines, crude oils, dye intermediates, fertilizers, leather, paper pulp, and numerous other valuable allied products.

At the present time there are twenty plants producing pure chemicals, dyes, dyestuffs, etc., with an investment of $17,500,000 and employing 2,500 men. This branch of the chemical industries stands next to the metal working industries in importance. These plants are for the most part, the direct offsprings of the by-product coke oven, which, by the way, is not as prevalent as it should be, for the bee-hive ovens are still much in evidence.

The next most important chemical industry is glass manufacturing. Glass is produced in West Virginia not simply for the reason that the raw materials abound here, or because of an unusual local demand for the product, but because natural gas is the most staisfactory fuel for glass making, and it is obtained in enormous quantities in many parts of the State. As a result there are fifty-two glass factories representing an investment of $12,800,000 in operation now, and others are in the process of building. These fifty-two plants employ 13,500 men. Their products range from crude bottle glass to the highest quality of plate and cut glass. Plants in Morgantown, the seat of the University, and neighboring villages produce bottles, window glass, wire glass, and cut glass.

Two other chemical industries, of less relative importance, are tanning and paper making. There are twelve tanneries in the State representing an investment of $2,000,000 and employing 1,100 men. The nine pulp mills represent an investment of $1,100,000 and employ 850 men.

WHY NOT TAKE ADVANTAGE OF THIS?

A special offer to students is made by the American Chemical Society. The three Journals: *Chemical Abstracts*, *The Journal of the American Chemical Society*, and the *Journal of Industrial and Engineering Chemistry*, are offered along with membership in the society for the small sum of ten dollars. The regular subscription price of these three journals is $15. The habit of reading the current literature on the subject, and keeping up with the latest developments of the science is something that is well to start early. A double advantage is gained, therefore, by taking advantage of this special students' offer: it costs less to become a member of the society, and to receive the three journals, and the habit of reading the current chemical literature will be formed.

THE DISTILLATION OF PINE PRODUCTS

By Louis Hanson
President Spirittine Chemical Co., Wilmington, N. C.

[This article is the first of a series, dealing with North Carolina Chemical Industries, which will be published in The Chemist. It is one of the purposes of The Carolina Chemist to foster chemical industries in the State, and we invite articles from manufacturers which describe their process of chemical manufacture.
Contributions to this column should be sent to the Editor.]

The process of destructive distillation is not a new one; the art having been carried on for more than a century. But its practical application to the distillation of pine wood in the United States, unquestionably dates back to 1878, when the owners of the Spirittine Chemical Company of Wilmington, North Carolina, first realized and proved the practicability of the enterprise. Their efforts were, for many years, confined to the preservation of wood, and the products manufactured by them were put to no other uses. After many years, the process of making turpentine direct from the wood was evolved, and for years that was the most important product. To realize fully the importance of this feature we must consider the following facts:

First—Within the past thirty years the turpentine industry has moved from North Carolina, where it was at one time pre-eminent, to lower Georgia, Florida and Mississippi. At the present rate of manufacture, it appears that it will not be many years before the turpentine orchards will be worn out. I refer now to the manufacture of the turpentine from the crude spirits, or gum, which is obtained by "boxing" or chipping the trees. This primitive method not only saps the vitality of the tree, but also destroys its usefulness for milling purposes, and if carried too far kills the tree.

Gum Turpentine, known as oil of turpentine, spirits of turpentine, or "Turps," is a light, volatile oil. Approximately 75 per cent of the world's supply of gum turpentine is made in the United States. The greater part of this is obtained from the Southern long-leaf yellow pine (Pinus palustris). A very small quantity of turpentine is produced from the Western yellow pine (Pinus ponderosa). The larger part of the remaining 25 per cent of the world's supply of gum turpentine comes form the coast regions of southwestern France, from the maritime or cluster pine (Pinus pinaster or maritima). Comparatively small quantities are produced also in Spain and Portugal, India, Central Germany, Russia, Norway, Mexico, and Central America.

Freshly distilled gum spirits of turpentine consists of several similar and closely related compounds known as terpenes, together with small and varying quantities of oxidized derivatives thereof. Chemically speaking, turpentine is a highly unsaturated substance, and combines directly with oxygen, nitric acid, sulpluric acid, and many other chemically active substances. The principal use of turpentine is for thinning paints and varnishes, approximately 85 per cent of the country's consumption being employed for this purpose. About 5 per cent is used for medicinal purposes, 3 per cent for various kinds of polishes, and the remaining 7 per cent is used in the manufacture of patent leather, synthetic camphor, and as a solvent in the rubber industry.

The old method of manufacture and equipment used for distilling the turpentine from the gum has not been materially changed during the past 75 years. Of the gum spirits produced in the United States, Florida produces 37 per cent; Georgia 19 per cent; Louisana 15 per cent; Alabama and Mississippi together about 21 per cent; Texas 7 per cent; and North and South Carolina together about 1 per cent.

Owing to the scarcity and high price of pure gum spirits, hundreds of substitutes have been placed on the market

during the past ten years. The price of pure gum spirits of turpentine was as high as $2.15 per gallon in 1919. However, this product was selling around 68 to 75 cents per gallon during 1921.

We must also consider that the lumber industries are eating up the forests and timber lands of the South in a marvelous manner. There are some mills, which were cutting from ten to twelve acres of land each day during the past five years, until the decline in lumber prices took place last year. Brick, stone, steel and iron may in time come to supplant the use of lumber for building purposes, but nothing known to science or manufacture can satisfactorily replace the wood crosstie.

Since the old method of manufacture used to produce turpentine and rosin and naval stores products is expensive, and the field of operation limited, let us consider the advantages of the process of destructive distillation. In the first place, the wood distiller begins where the lumber man and the old-time turpentine manufacturers leave off, that is: we use the fat lightwood stumps, knots, fat slab-wood and box-face wood, or refuse from the lumber mills. The very field that is deserted by the turpentine manufacturer, using the old method of "boxing" the trees and collecting and stilling the crude spirits is the Mecca of the wood distiller. It is there that he gets his raw material in the largest quantities and at the lowest prices; the lightwood being practically useless except to the pine wood distiller. The greatest cost is the labor used in cutting and hauling to the plants. The supply of this crude material is unlimited, and the field of operations covers the entire South, upper New England, Oregon and Washington.

The Process of Destructive Distillation

I shall now try as nearly as possible, avoiding technicalities where practical, to describe the process of destructive distillation as applied to the manufacture of wood turpentine and other pine wood products. Destructive distillation, as the name indicates, destroys; in other words, chemical changes take place and new matter is formed, possessing properties possibly entirely different from the crude material used.

It is, in this case, driving out by intense heat, all of the volatile and liquid matter in the wood and condensing and collecting this crude distillate. The original form of the wood is destroyed and in its place are divers liquids and more or less pure carbon, or charcoal. Of course, there must be no combustion, or the valuable properties of the products would be destroyed. The process is carried on in huge steel retorts. These are set in brickwork or masonry, in very much the same way as a boiler, having a space beneath for the fire. The retorts must be made so that they can be hermetically sealed during distillation, as any ingress of air or outlet of gas or vapor must be avoided. The size of the retort best adapted for the work is a moot question. The wood is stowed as closely as possible in the retorts, the doors hermetically sealed, and then the fires started in the furnaces beneath the retorts. In a few hours the distillation begins, the liquids are driven from the wood by the intense heat, and there being no ingress of air, and subsequently no combustion, these liquids become vapor and pass from the retort through an elbow or "goose neck" into a condensing tank where these vapors are condensed according to their gravity, and flow into receiving vats in liquid form. The liquid products are pumped into secondary stills, where they are re-distilled and by fractional distillation and chemical treatment they are separated into various oils and by-products. After the retorts are allowed to cool, the residue, which is a pure charcoal, is drawn. The retorts are then ready for the next charge. The charcoal is used for fuel, and practically offsets the fuel expense.

The products of the first distillation come over in the form of light, amber-colored oil, together with a quantity of glacial acetic or pyroligneous acid. The oil, which at first appears light in

color, very soon assumes a darker hue and becomes thicker in consistency. After being pumped into another still, it undergoes a second distillation from which wood spirits of turpentine and light and heavier oil are evolved, leaving a residue of heavy consistency; in other words, *Oil of Pine Tar*. The spirits from the distillation are not water white but are amber colored, and a further distillation is required to cause this slight color to disappear.

Diversity of Products

In speaking of the diversity of the pine products, with their uses, I shall give as an illustration the products of the Spirittine Chemical Company, as they have carried the art further than anyone else.

First, consider the actual amount of products obtained from one cord of lightwood. The results, or yield, from one cord of good, fat, lightwood, approximate fifteen gallons of wood turpentine; sixty gallons of oil; and a like quantity of pyroligneous acid; in other words about three and one-half barrels of products, almost equaling in bulk the cord of wood used. In addition to this yield, the residue of charcoal equals about one-half the amount of wood used.

The uses of turpentine have already been mentioned, but suffice it to say that the demand was never so great for this product as it is today. We next have the oils—light and heavy, with specific gravity from 0.85 to 1.04.

A large percentage of the lighter oil is used by the leading mining engineers in the flotation processes, for the separation of the minerals from the dross. The value of this pine oil as a most satisfactory flotation oil, was only discovered during the more recent years, and it is now being used throughout the United States and Mexico by the largest mining operators and engineers.

Next, we have a creosote oil, which is chemically free from all acids and has a specific gravity of approximately 1.03 This oil contains 50 per cent of creosote and about 50 per cent of neutral insoluble oils (paraffines), and as a parffine oil is insoluble in water, and the wood creosote is a powerful antiseptic, the combination of the whole makes it one of the best and most perfect wood preservatives in existence.

The next oil is a pure pine creosote oil, which will mix with all dry pigments and produces an excellent paint for metal and wood. This is also used by some of the largest manufacturers of shingle stains in the country.

Next, we have an oil which has the following analysis: Volatile terpenes, 21.6 per cent; Dextro-Rotation in 10 c. m. tube 2.4; Boiling range 180-220° C; Specific Gravity at 18°—0.928, and Iodine Number 107.5. This oil has been carefully and thoroughly tested out during the past ten years by leading chemists and results of these tests have proven that it contains ingredients and properties especially valuable in the manufacture of reclaimed rubber products.

The next three oils obtained are used principally in the manufacture of various disinfectants, insecticides, and germicides.

Then we have the Oil of Pine Tar, which has a specific gravity of 1.04 and 1.05. This oil, being absolutely pure and unadulterated, is used by many of the largest manufacturing druggists and chemists.

Lastly, we have a pyroligneous acid which is perhaps the least valuable of the products. However, this is used for making the iron liquor for dyeing purposes, acetate of lime, from which vinegar is made, sodium acetate and other chemicals. It has been used to some extent for curing or "smoking" meat, giving to fresh beef, in a few hours, that delicious smoked flavor formerly attained only after days and weeks of treatment. But many of the uses of the pine tree products have not yet been discovered; as a matter of fact, the entire industry is still in its infancy, and each year sees new uses for its products and new improved methods for refining.

There have been probably 200 or more wood distilling plants begun in the United States, though for various

reasons, nearly the entire number have ceased operations; but the business itself has passed from the experimental stages and has assumed a solid and established footing among Southern industries today. The plants of the Spirittine Chemical Company, at Wilmington, N. C., and Malmo, N. C., have been in constant operation for the past forty-four years, and are the oldest and largest pine wood distillers and refiners in this country today. This company enjoys a world-wide trade; shipments being made throughout the United States, Mexico, Alaska, France, England, and India.

THE DOINGS OF THE FACULTY DURING THE SUMMER

By George Murphy

Dr Venable rested all summer and we certainly think that he has earned it. His vacation has enabled him to teach again this winter.

Dr. Bell had a very busy summer. Besides teaching in the summer school, he assisted Mr. W. N. Pritchard of Cooper Union, who conducted some experiments here on the electro-chemical action of zirconium. After the summer school was over, Dr. and Mrs. Bell drove to Washigton in their "Ford." From there, they drove on to Toronto, Canada, Dr. Bell's home, visiting friends at Cornell University on the way. Dr. and Mrs. Bell joined Dr. and Mrs. Wheeler in Quebec and from there went on to Montreal to attend the meeting of the Canadian and English chemists, which was held at McGill University. From here, they drove down through the Adirondack mountains to New York City, where they attended the sessions of the American Chemical Society. They also went to the Exposition of Chemical Industries which covered several city blocks. From New York, they drove back through Washington to Chapel Hill. Dr. Bell's speedometer registered 4,100 miles when he reached Chapel Hill again and he says that his "Ford" gave him no trouble at any time.

Dr. Wheeler also taught in the summer school. He says that this year more students than ever took up research during the summer. Instead of procuring research materials in the open market, this year, Messrs. Smith and Andrews prepared them here. Dr. and Mrs. Wheeler visited Dr. and Mrs. Leavitt on the coast of Maine. From here they joined Dr. and Mrs. Bell at Quebec, going with them to the chemical meetings in Montreal and New York City. They also attended the exposition which was held in the Eighth Coast Artillery Armory there. Dr. Wheeler met several Carolina alumni among which were Victor Edwards, Dr. Baskerville, Dr. Mills, Dr. Herty, and Dr. D. H. Killerfer.

Dr. Dobbins says that he did nothing during the summer. But if one will walk down Cameron Avenue and notice the beautiful new house about a block west of the campus, he will have to agree that Dr. Dobbins is as good an architect as he is a chemist.

Dr. Vilbrandt spent all of his summer preparing a series of bulletins on air pollution and purification. The work was carried on at Ohio State University for that institution and the Air Purification Committee of the American Society of Chemical Engineers. Twenty-one of these bulletins were issued.

Mr. I. V. Giles spent most of his summer on investigations for his thesis, "The Chlorination of Para-Cymenes." He spent the rest of his summer fishing.

Mr. H. M. Taylor spent his summer working on kelp oils for his thesis.

NEW BOOKS BY DR. FRANCIS P. VENABLE

Zirconium and Its Compounds.—This book of some 350 pages gives a fairly complete account of the occurrence, preparation, and properties of zirconium and every known compound. The uses of the metal and its compounds are outlined and a list is given of the patents covering these uses. Much the most complete bibliography up to the present time is appended. It is to appear shortly as one of the monographs issued under the auspices of the American Chemical Society.

History of Chemistry.—This book, which was first issued in 1894, has had several revisions and new editions have been issued. It has now been entirely rewritten for the coming edition, involving a change in arrangement and treatment and bringing it up to date. It is to be published in the near future by D. C. Heath & Co., of New York.

Introduction to Chemistry for Schools.—This book is in process of preparation. The treatment of the subject is different from that of the usual school text. The effort is to make constant appeal to the knowledge gained in childhood of the ordinary processes observed in everyday life, studying these in some detail and bringing out the fundamental facts and great underlying principles. Additional facts are given and stressed only in so far as they bear on these great ideas. The object is to inspire the youthful mind with a desire to search out causes, to add new facts and to reason logically.

THE CHEMISTRY FEED

By George Murphy

One needs only to mention the word "feed" to a chemist, when, with an eagerness that defies description, he jumps to a state of disorderly motion, in much the same state as we believe the molecules of a gas in an enclosed vessel, and clamors at the door for entrance to form a compound whose elements are "feed" plus "self."

And so it was on October 27, the annual Chemistry feed was held in Chemistry Hall. Dr. Bell, acting as toastmaster, introduced the speakers of the evening. Dr. Venable spoke first, welcoming the new men of the Freshmen class into the Chemistry Department. Dr. Wheeler spoke of the meeting of the Canadian and English chemists, which he and Dr. Bell attended during the summer. He also told of the Chemical Exposition and its meeting in New York City. Dr. Wheeler spoke of seeing Victor Edwards, an old Carolina alumnus, who told him something of the new synthetic camphor industry in this country.

Dr. Vilbrandt, the new professor of Industrial Chemistry, who comes to us this year from Ohio State University, discussed several phases of the chemist's work, stressing research. He also mentioned some of the problems which confront the research chemist.

Mr. I. V. Giles very cordially welcomed the new men, telling them to make themselves feel at home in Chemistry Hall. Mr. S. C. Smith read some startling discoveries which were made by members of the Class of '25. The newly elected editor of The Carolina Chemist, Mr. J. A. Bender, told something of the history and purposes of the publication. After this, the election of the other members of The Chemist's staff was conducted.

When this part of the program was finished, Mr. Mourane and Mr. Moehlmann, sponsors for the feed, directed the hungry chemists to the table which was lined from end to end with goodies of no small import, from the sparkling, reddish-violet "punch" to the hard, white mint drops. After full justice was done to the good things, the rest was taken home to the sick room-mates.

The chemists welcomed Mrs. Wheeler, Mrs. Vilbrandt, and Miss Venable as guests of honor.

THE LONG, LONG TRAIL

By I. V. Giles

Most of us, after taking Chemistry two or three years, begin to look forward towards graduation and getting out into the world to earn a living. At the same time we begin to realize in the chemistry profession what a little we actually know! We look at others who have finished the four-year course. We see some of them—a few—holding down good jobs; we see others that have gone into other lines of work; and we see some who are sticking to chemistry because they studied chemistry, and who are making no progress—not forging ahead but merely holding their own. And in our meditations we also see those who didin't stop with the four year course, but followed it up to a higher degree. And here most of all we see men who are holding down good positions and making progress in very rapid strides.

As the time for graduation draws nigh we begin to wonder what we are going to do. The future seems so awfully short. We wonder if it would be advisable to stay in college any more. The idea of spending three or four more years in college completely dumbfounds some of us. We can't see that we would gain by it. We have all sorts of visions of the future, and often even on graduation day, or months after, we have not the slightest idea of what we are going to do. The idea of more work behind college walls is always remote from us. "It's too long," we say.

But should we look at it this way? Are we giving a post-graduate course due consideration? We remember when we finished preparatory school the four years of college looked very distant. We wondered if we would ever finish it. And after it's done, it seems only yesterday when we were lined up in the Freshman registration room. We ask any man who has taken a post-graduate course and he advises us to take all the college training we can, while we can. We ask any man who didn't take a post-graduate course and he tells us how he regrets he didin't and advises us to do so. If we consider the advice of others, we are apt to ask ourselves this question: "How will a post-graduate course help me?"

The answer that the writer, an individual who has had some post-graduate work, would give to this question is that a post-graduate course is well worth the time and effort which it demands. The four years of under-graduate work in chemistry merely gives us an idea of how things take place in chemistry. Graduate courses with research brings to us new things every day. We develop self-confidence and accuracy in observations; and what is more important, the ability to account for our own observations and results. In short, research is the shaping of a crude chemist into the finished product, just as the sculptor shapes his statue from the block of hewn stone.

The professional man has to devote more time to his education than the business man. The best lawyers and doctors are those who take an A. B. degree, and the time is soon coming when such servants of the public as those who must secure State license to practice their profession, will all be required to have as a prerequisite an A. B. degree. And the chemist to be a success must not only learn how to do research work, but must actually perform some, if he wants to be assured of a chance of success. A post-graduate course offers the opportunity. Will we take it?

ALPHA CHI SIGMA

By E. DeW. Jennings

Rho Chapter of Alpha Chi Sigma started off the year with eleven men. Two new members have recently been initiated: Frederick P. Brooks of Kinston, N. C., graduate; and Ernest O. Moehlmann of Hickory, N. C., Senior. There are two pledges to be initiaed: S. C. Smith of Chapel Hill, graduate; and H. N. Correll of Spartanburg, S. C., Junior.

Of last years men who did not return, Andrews and Nelson are in chemical industries; Harris, Carroll, and Ogburn are teaching; Dietz is with the N. C. Highway Commission; and Guard is a potato broker.

Old men entertained during the Carolina-Virginia football game were: Carroll, Nelson, Murray, Sawyer, and Spry.

We have this year a newly-built, ten-room chapter house, large enough to house the entire membership, and more room for social functions, located near the post office.

With our new quarters and a fairly large membership for the fall quarter, we look forward to a very successful year.

RESEARCH IN THE DEPARTMENT

The following investigations are being conducted under the guidance of Dr. A. S. Wheeler:

Mr. I. V. Giles is continuing work upon the chlorination of 2-Amino-p-cymene. Orientation studies have already proved that the one chlorine atom which enters the nucleus occupies position 5. Also studies of the hydrochloride, acetyl and benzoyl derivatives have been completed. The current year is being devoted to other reactions.

Mr. S. C. Smith is engaged in solving some constitutional questions in hydroxy derivatives of chloral-nitroaniline condensation products. There is considerable doubt that the grouping—CCl_2OH—represents a stable condition.

Mr. H. M. Taylor is extending the work begun by Dr. I. W. Smithey upon the bromination of 2-Amino-p-cymene. There is still doubt about the constitution of the monobromo derivative.

Mr. F. P. Brooks is undertaking a study of the complex reaction between phenylsemicarbazine and diketones, using acetonylacetone as an example of the latter.

Mr. A. P. Sledd is engaged in an attack upon the constitution of "Oxyjuglone," a substance first made in 1885 but entirely neglected since that time.

Mr. B. Naiman is preparing 2-Bromo-5-hydroxy-1, 4-naphthoquinone in order to study its chemical behavior. This compound was first prepared in this laboratory a few years ago.

Mr. T. P. Dawson is studying the action of alcohols upon the addition product of 3-Nitro-4-toluidine and chloral.

Mr. C. K. Brooks is preparing 2, 6-Dihydroxynaphthalene from Schaeffer's salt in order to convert it into a quinone by some oxidation process.

A grant of five hundred dollars to Dr. J. M. Bell by the American Academy of Arts and Sciences to pay for material and apparatus has enabled him to continue his work on the nitro-toluenes with more extensive investigations. This year there are four men doing research in Physical Chemistry and each one has some phase of the subject of nitro-toluenes as his problem. H. D. Crockford is working on the latent heat of fusion of the various nitro-toluenes. J. L. McEwen is preparing a chart showing the freezing point of mixtures of the three mono-nitro-toluenes. H. G. Pickett and W. B. Smoot are following the course of nitration of ortho-nitro-toluene and para-nitro-toluene respectively.

Dr. J. T. Dobbins is directing the research of the following men: J. H. Mourance and E. DeW. Jennings are working on a modification of the perchloric acid method for the determination of potash. N. W. Taylor is making a study of some of the complex cobaltinitrites.

Dr. F. C. Vilbrandt is directing the research of the following men: Messrs. J. A. Bender and F. C. Cochrane are studying the application of the floating equilibrium method for determining the solubility of nickel sulphate and magnesium sulphate, respectively. This method can find extended application in the industries, being exceedingly rapid and accurate, when the floats are but once calibrated for the specific materials in solutions under investigation.

Dr. F. P. Venable is continuing his work on zirconium and working under him are Messrs. E. O. Moehlmann and R. A. Lineberry. The former is working on the preparation of Ferro- and Ferricyanides of Zirconium, while the latter is preparing Citrates of Zirconium.

A WORD ABOUT THE MEN WHO RECEIVED DEGREES IN 1921

Ph. D.'s

Dr. I. W. Smithey is Associate Professor in Chemistry in the University of West Virginia.

Dr. T. M. Andrews is with the Amproco Co., Reidsville, N. C.

Note—Dr. Andrews' address changes in January, but his new address was not learned in time to insert in this issue.

S. B.'s

"Bob" Deitz is with the Highway Commission of Mecklenburg County.

L. M. Nelson is Consulting Chemist at Smoot Tanning Company, North Wilkesboro, N. C.

"Pete" Harris is Instructor in Chemistry at Tulane University.

"Dunk" Carroll teaches science and chemistry in the high school at Dardens, N. C.

"Sis" Ogburn, who married two weeks after commencement, is happily situated at Lexington, Va., where he is connected with the Department of Chemistry in Washington and Lee University.

J. W. Guard says "there's no place like home" and is working with his father in Coinjock, N. C.

A. B. Owens is working with the Dyestuff Sales Department of the E. I. Du Pont de Nemours and Company, Charlotte, N. C.

F. P. Brooks and B. Naiman are back with us taking graduate work.

A NEW MOVEMENT

As an added means of getting new men better known in the Department, and also as an added tie for the "old timers," the Journal Club starts this year the custom of initiating the Sophomores into its myseries and secrets. A Ceremony and ritual has been drawn up by a committee and the initiation will be held in the near future. This is no place to divulge said mysteries and secrets, but it is sufficient to say that said "old timers" can wield a nasty paddle when the occasion demands. Yea, verily, and the neophytes will be able to distinguish the smell of capsicum and the taste of valeric acid, or vice versa.

YE GODS, WHAT NEXT?

Manifestly magnificent results have resulted from the marvelous research carried on by the freshmen in Chemistry 1. The powers-to-be are highly gratified and brilliant futures are predicted by these young followers of the elusive atom. Space does not permit us to publish all the theses submitted; therefore only the best are given below. Because of the bashfulness of the authors their names are witheld.

Hydrogen.

Hydrogen, which is used to drive oxygen from one bottle to another, is prepared by the electrolysis of electricity. Its principal uses is to purify the atmosphere and to cut nails. Hydrogen gas, like other gases, varies as the square root of its properties.

Matter.

Matter is the unrefined stuff of which everything is made. People are made of matter; as things which are not made of matter do not exist. Matter is made of elements. An example of a chemical element is electricity. Paper is an element because it is magnetic.

Oxygen.

Oxygen, which animals breathe with perfect contentment, is prepared by causing a substance to form the gas by means of raising it to a high temperature with wood alcohol and water, and then catching the gas formed.

The Atomic Theory.

The Atomic Theory states that all matter is full of invisible holes which are called atoms. The atmosphere has these holes just like a picture of wheat. Another way of expressing the Theory is to say that every thing in the universe is made of atoms and molecules in a definite proportion, and if the atoms could be destroyed we would approach affinity and there would be nothing. The atoms are ruled by the Laws of Multiple and Definite Proportions.

We must live and learn!

CAPITAL ADVICE

The Chemist has no E Z life,
  And if he would X L,
He must get all the A D can,
  R E cannot do well,

He will become a C D man,
  And oft be called A J,
Unless he gets what L P can,
  Obtain in N E way.

So if he fondly hopes 2 B
  Successful ere he die;
In K C wants to stand with men
  Who R A counted high.

Let him work hard and take A Q,
  B E so very wise,
If every D D does is right,
  He surely must R I's.

Let him keep B Z every day,
  And C K task to do,
Or L C cannot hope 2 C
  The N D has in view.

—Wm. H. Woodell in *Chemist Analyst.*